DETERMINANTS OF ADVERSE PREGNANCY OUTCOMES AMONG WOMEN OF REPRODUCTIVE AGE INDIA: A SECONDARY DATA ANALYSIS

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Abstract

Introduction: The relevance of maternal health and child care is emphasized by both human rights and development perspectives.

Methodology: A secondary analysis of the fourth National Family Health Survey (2015-16) data was done to identify the risk factors of adverse pregnancy outcomes among women of reproductive age in India. 6,99,686 women were included for the study who represented all states and union territories of India. Statistical inference was drawn using the Pearson Chi-square test and binary logistic regression using software IBM SPSS version 25. Results with a p-value less than 0.05 was considered statistically significant.

Result: It was found that the prevalence of adverse pregnancy outcomes in this study was 12% among women of reproductive age in India. The factors that were found significantly affecting the occurrence of adverse pregnancy outcomes were maternal age, marital status and education attained. Women belonging to certain casts and religions were found to be at higher risk of suffering from a miscarriage. Certain behavioral factors like usage of smokeless tobacco, BMI, experience of domestic violence and utilization of healthcare facilities were also found to be important in determining the quality of maternal health and childcare.

Conclusion: The study's findings reveal that the causes of poor pregnancy outcomes in India are complex. As a result, it advocates for horizontal collaboration between many sectors to address the need to improve women's health and fulfill the nutritional needs throughout their lives. Efforts to raise women's understanding of their reproductive rights are critical in allowing them to make educated decisions that protect them from cultural and religious conventions.

Keywords: Adverse pregnancy outcomes, India, socioeconomic – demographic factors, behavioral and lifestyle factors, health system determinants, still birth, abortion, miscarriage.

Introduction:

Concerns about maternal health and child care have been raised in the past decade and efforts have been made to implement policies to improve the condition of healthcare services being provided to expecting mothers. Although maternal and child health is an important public health concern, there are far too many women, infants and children in India who have little or no access to essential needs like quality health services and education, clean air and water, and adequate sanitation and nutrition.

Burden of Adverse pregnancy outcomes: Adverse pregnancy outcomes are the unintended outcomes of pregnancy in terms of abortion (the spontaneous or induced termination of pregnancy before foetal viability), miscarriage (pregnancy termination before 20-week gestation) and stillbirth (a baby who dies after 28 weeks of pregnancy, but before or during birth).[2], [3], [4], [5] The World Health Organization (WHO) has reported around 3.3 million foetal deaths annually across the globe. [6] Estimates demonstrate that, of the 50 million induced abortions that take place worldwide, 45% are unsafe [7]. An estimated 2.6 million stillbirths occur annually i.e., 7178 stillbirths per day [5]. In 2018, 6% pregnancies ended up in a miscarriage [8]. The highest foetal mortality rate is recorded from a Central African country, Nigeria, with 74.2 deaths per thousand live births. Iceland is a country which shows the least infant mortality rate worldwide at 0.16 deaths per thousand live births which depicts 170 times higher chances of an infant surviving.[9]

- **Factors affecting adverse pregnancy outcomes:** Multiple factors influence the viability of a foetus inside the mother's womb, ranging from genetics to the mother's exposure to broad social, environmental, and politico-legal issues. However, depending on the mother's living circumstances, the reasons for abortion, miscarriage, and stillbirth may differ.

The incidence of adverse pregnancy outcomes varies among women based on their age, place of residence, marital status, education obtained, occupation, religion, class and financial status. [5] Further, reproductive and obstetric history like parity and age during the first pregnancy of the mothers also matter. Short intervals between pregnancies increase the chance of adverse pregnancy outcomes, particularly spontaneous abortions, in mothers under the age of 20 years. [10] Inadequate awareness about pre-existing illnesses in mothers such as anaemia, hypertension, diabetes, depression, obesity or asthma can lead to adverse pregnancy outcomes like spontaneous abortion, miscarriage or stillbirth. The cultural norms and beliefs lead to pregnant women refusing or delaying the acceptance of obstetric emergency care that results in pregnancy related complications and can also lead to death of the mother and/or the child. [11]

Irregular follow-ups for antenatal care and lack of access to appropriate medical care also increase the risk of adverse pregnancy outcomes. [12] From the above-mentioned evidence, we can infer that adverse pregnancy outcomes are a serious public health issue globally. [13]

Methodology:

- **Research Methods:** The present study was a secondary data analysis. The National Family Health Surveys (NFHSs) are nationally representative sample surveys addressing multiple health related events along with socio-demographic and economic attributes. The present study used the fourth NFHS data to answer the research questions. The NFHS-4 was conducted across all Indian states and Union Territories during the year 2015-16 under the stewardship of the Ministry of Health and Family Welfare (MOH&FW) and was led by the International Institute for Population Sciences (IIPS). The survey is representative not only at the national and state levels but also at the district level. The NFHS survey was cross-sectional in design and used random sampling to collect the data. The information of 601,509 households, 103,525 men and 699,686 women was collected in NFHS-4 (International Institute for Population Science (IIPS) and ICF, 2018). The data on socio-demographic and economic background, behavioural-lifestyle and health care utilization factors was also collected.

Survey period: January 20, 2015- December 4, 2016

- **Research setting:** The aim of the present study was to find out the determinants of adverse pregnancy outcomes among women of reproductive age in India using NFHS 4 data. Therefore, the research setting is India as a whole. The survey collected information about the life-time occurrence of abortions, miscarriages and stillbirths from the women of reproductive age. Combining the three, the variable of adverse pregnancy outcomes was created.

Study population: Women of reproductive age (15-49 years) in India.

Sample size estimation: The state-level data of all the states and union territories was aggregated for this study. In NFHS-4, there were 6,99,686 women in the reproductive age group (15 to 49 years). The extracted dataset was applied with sample weight in order to ensure uniformity in the sample size selected for the study. For this women's sample weight (SV005) is applied for the data set.

- **Research variables and operational definitions:**

Dependent variable: Adverse pregnancy outcomes.

Women of reproductive age who have experienced stillbirth, miscarriage, or abortion in their lifetime.

Independent variables:

a. Socio-demographic and economic variables:
- Place of residence (Rural and Urban)
- Age (15-24,25-34,35-49 in years)

- Caste (scheduled caste, scheduled tribe, other backward class, none of them)

- Religion (Hindu, Muslim, Christian, other)

- Education of mother (illiterate, primary, secondary, and higher)

- Marital status (unmarried, married, widowed, separate)

- Wealth index (poor, middle, rich)

- Employment (unemployed, permanent, temporary, agricultural)

- Age of first pregnancy (15-24, 25-34, 35-49 in years)

- Parity (nulliparous, primiparous, multiparous, grand multiparous)

b. Behavioural and lifestyle variables:

- Substance abuse (smoking tobacco, smokeless tobacco, alcohol)

- Domestic violence (ever hurt during pregnancy- yes/ no)

- Body Mass Index (underweight, normal, overweight, obese)

- Anaemia (severe, moderate, mild, no anaemia)

- Diabetes mellitus (yes/ no)

c. Health care system utilization variables:

- Health facility utilization (public, private, other)

- Health worker interaction (ANM, ASHA, Anganwadi worker, others)

- Number of antenatal care check-ups during pregnancy (no visit, 1-4,5-8, 8+).

- Tetanus injection received (not received, 1-2, 3-6, 7+)

- Components of ANC visit received (yes/ no)

- **Data collection tools and techniques:**

The Demographic Health Surveys authorised data access request and provided microdata (NFHS-4). Individuals are used as the analytical unit. The age of the ladies was employed as a selection variable for data extraction.

A subset of the data was developed for women aged 15 to 49. Data cleaning is the process of detecting and removing (or correcting) errors and inconsistencies in data that have arisen as a result of erroneous data entering. Inaccurate, incomplete or irrelevant data is identified and then either modified, replaced or deleted. Data cleaning and preparation was done for addressing inconsistencies and treating the missing data in the selected variables using frequency tables. Coding and recoding were done for variables wherever necessary. All the statistical analysis in this study were performed using the statistical software IBM SPSS version 25. The analysis was conducted in three stages. To begin, a descriptive univariate analysis was performed to determine the distribution of putative factors of unfavourable pregnancy outcomes among the study's participants. Second, bivariate analysis was used to determine the relationship between dependent and predictor variables using the Pearson Chi-square test. After correcting for other variables and potential

confounders, the third stage included a multivariate analysis using binary logistic regression to determine the independent influence of predictors on unfavourable pregnancy outcomes. To begin, a descriptive univariate analysis was performed to determine the distribution of putative factors of unfavourable pregnancy outcomes among the study's participants. Second, bivariate analysis was used to determine the relationship between dependent and predictor variables using the Pearson Chi-square test. After correcting for the other variables and potential confounders, the third stage included a multivariate analysis using binary logistic regression to determine the independent influence of predictors on unfavourable pregnancy outcomes. The independent variables were recoded according to the requirements of our study for attaining the desired categories in each of the independent variables. The recoded independent variables were again recoded for reversing the default set reference category. Results with a p-value less than 0.05 were considered statistically significant.

Results:

a. **Baseline characteristics of respondents**: The results of univariate analysis are described in this section.

Socio-demographic and economic attributes of the study participants: Table 1 depicts the socio-demographic and economic characteristics of the study participants. The study consisted of 6,99,686 women respondents from India, among them nearly 71% women belonged to rural areas and the rest to urban areas. The distribution of study participants in different age groups did not vary widely. Most of the participants were married (73.3%) followed by 22.5% unmarried women and a few widowed (3.1%) and divorced women (1.1%). Around half of the population (47.3%) had acquired secondary level education, though more than one fourth were still illiterate. Workforce participation of women in the study was very less i.e., 30%.

According to the caste distribution, women from Other Backward Classes were found more in number (45.5%), followed by forward castes, scheduled castes (21.3%) and scheduled tribes (9.3%). The wealth Index of the participants showed that more than one-third of them were poor (37.3%) compared to other wealth categories like middle class (41.7%) and rich (21.0%).

Behavioural and lifestyle factors: Table 2 depicts the study population's behavioural and lifestyle characteristics. Substance addiction was shown to be less common among the respondents in general. Domestic abuse was experienced by nearly 4% of the pregnant women. Anaemia affected nearly half of the women.

Health care facility utilization factors: Table 3 depicts the health care received by the participants during pregnancy. About three-fifth of the participants used public health facilities during pregnancy. One-third of them had contact with Anganwadi workers, 31% with auxiliary nurse midwife (ANM) and 28.4% with accredited social health activists (ASHA) during their gestational period. More than half of them had four or

more antenatal visits. Majority of the women had received a minimum two doses of tetanus injection as part of the ANC visit. 8.1% did not receive any dose of tetanus injection during their lifetime. Most of the respondents (78.5%), have completed all the ANC components during their visits which includes abdominal examination, urine-blood investigation and blood pressure check-up.

b. **Prevalence of adverse pregnancy outcomes:** From the study it is found that 12% of the women respondents in India have reported adverse pregnancy outcomes in the form of miscarriage, abortion and stillbirth. Prevalence of miscarriage is the most reported outcome (7.3%) followed with abortion (3.6%) and still birth (1.1%).

c. **Factors affecting adverse pregnancy outcomes:** Pearson Chi-square method is used to examine the statistical association between the adverse pregnancy outcomes and the independent variables in the study. The results are given in the following sections.

Socio-demographic and economic factors affecting adverse pregnancy outcomes: As evident from table 4, the study found a statistically significant association of adverse pregnancy outcomes with all the variables considered. Adverse pregnancy outcome was found higher among women from the urban areas than those from the rural areas. The age of women was also an important determining factor. The occupation of women was also found to be closely associated with adverse pregnancy outcomes; it was especially evident among women who worked in the temporary job sector. Those who reported not belonging to any religion had the least prevalence of adverse pregnancy outcomes whereas the prevalence was more or less similar across all the religious groups.

All caste groups, with the exception of scheduled tribes, had a statistically significant connection with adverse pregnancy outcomes among the study participants. When compared to women who became pregnant at a younger age, women who had their first pregnancy later in life had a higher risk of having adverse pregnancy outcomes.

Behavioural and dietary factors associated with adverse pregnancy outcomes: Table 5 shows the link between lifestyle and behavioural characteristics and adverse pregnancy outcomes among Indian women aged 15 to 49 years. The table shows that women who use tobacco (both smoking and smokeless tobacco) and alcohol have a higher risk of having adverse pregnancy outcomes and this conclusion was statistically significant. The proportion of adverse pregnancy outcomes was found higher among overweight or obese mothers and diabetic mothers. Women with anaemia were also found to have a statistically significant association with adverse pregnancy outcomes.

Health care utilization and adverse pregnancy outcomes: As evident from table 6, the study found a statistically significant association of adverse pregnancy outcomes with all the variables considered. Women

who visited public health facilities were found to have a lower prevalence of adverse pregnancy outcomes compared with women who visited other health facilities. In addition, there was a significant link between health worker engagement and adverse pregnancy outcomes. The women who couldn't complete the components of ANC visits like blood pressure screening, abdominal examination, urine – blood investigation showed a higher prevalence of adverse pregnancy outcomes than other women.

d. Factors independently associated with adverse pregnancy outcomes:

Factors independently influencing adverse pregnancy outcomes in women: Results of binary logistic regression are depicted in table 7. Older mothers were at higher risk of having adverse pregnancy outcomes compared to their younger counterparts. Compared to educated women, the risk of adverse pregnancy outcomes in illiterate and primary educated mothers is nearly doubled when all the other factors are held constant. Married women were more vulnerable to face adverse pregnancy outcomes in their lifetime as compared to single women. Participants who belonged to Hindu religion had a 1.7 times higher risk of having adverse pregnancy outcomes than those who belonged to other religions. Women from Islam religion were also at a higher risk; however, it was significant only at 90% confidence limits. The risk of having an unfavourable pregnancy outcome was increased by 2.6 times with the consumption of smokeless tobacco. Women who have suffered domestic abuse while pregnant are 1.8 times more likely to have a miscarriage.

When all the other characteristics are held constant, completion all the components of an ANC visit by a pregnant woman, such as abdominal examination, blood pressure check-up, and blood and urine investigation, was revealed to be a substantially protective factor against adverse pregnancy outcomes. Other factors like place of residence (OR=0.982, CI 0.835 to1.155), occupation (OR=1.131, CI 0.713 to 1.792), wealth (OR=1.098, CI 0.932 to 1.294), parity (OR=1.143, CI 0.971 to 1.345), age at first pregnancy (OR=1.143, CI 0.971 to 1.345), usage of smoking tobacco (OR=0.726, CI 0.489 to 1.077), alcohol consumption (OR=1.605, CI 0.882 to 2.922), anaemia (OR=0.883, CI 0.441 to 1.771), ANC visit (OR=0.850, CI 0.723 to 1.000), tetanus injection received (OR=1.103, CI 0.811 to 1.500) were not found to be statistically significant towards adverse pregnancy outcomes after multivariate analysis.

Discussion:

1. **Prevalence of adverse pregnancy outcomes in women of reproductive age group**: When the consecutive reports of NFHS (third and fourth) were compared, it was found that the prevalence of adverse pregnancy outcomes has reduced from 14% to 12% over the past five years (International Institute for Population Science (IIPS) and ICF, 2017). It is also less than that of the neighbouring countries like Afghanistan (16.6%) and Pakistan (19.2%). [14], [15] The higher proportion of

miscarriages is a concern that indicates the lacunae in existing programmes and policies to promote maternal and child health.

2. **Factors affecting adverse pregnancy outcomes in women:**

2.a. Socio-demographic and economic factors affecting adverse pregnancy outcomes: The lower prevalence of adverse pregnancy outcomes in urban areas is in consonance with the findings of previous studies and it is attributed to the availability and timely access to health care services that can prevent adverse pregnancy outcomes. Whereas in rural areas, inadequate health care facilities along with stringent and stigmatizing cultural and religious norms lead to the increased prevalence of adverse pregnancy outcomes. [10], [16]

Though sufficient evidence is not available to support this, the sex selection and the preference for a male child is prevalent in many states of India. Since sex determination is banned legally in India as per the Pre-Conception and Pre-Natal Diagnostic Techniques (PCPNDT) Act in 1994, feticides and infanticides are done using unscientific methods, in unsafe conditions, and by non-qualified practitioners. [18] The data from United Nations Children's Fund (UNICEF) reveals that 0.6 million infanticides happened during the year 2019 in India.[19], [20]

Poor nutrition, a lack of access to adequate health care, especially during emergencies, and inconsistent antenatal care follow-ups make poor women more vulnerable to adverse pregnancy outcomes. [22] Women who worked part-time or did agricultural labour had a higher risk of having a bad pregnancy than women who worked full-time or were jobless. They are virtually invariably from low-income families, and their vulnerability may drive them to work even when pregnant. [23]

2.b. Behavioural and lifestyle factors associated with adverse pregnancy outcomes: The latest research supports previous suggestions that smoking is connected to poor pregnancy outcomes. Women are more likely to use smokeless tobacco than other sorts of substances, and those who do so are more likely to have a difficult pregnancy. [24], [25]

Physical or sexual violence during pregnancy negatively impacts the health of both child and mother. [23] The present study reached the same conclusion, emphasising the significance of educating women and adopting strict regulations to ensure their safety both inside and outside the home.

2.c. Health care facility utilization factors associated with adverse pregnancy outcomes: Women who received antenatal care at a public facility were more likely to receive treatment from skilled practitioners, which helped to ensure a healthy pregnancy. Those who seek treatment from other illegal establishments and practitioners endanger their own lives as well as the lives of their children. Many women have been supported and encouraged by health workers like ANMs, ASHAs, and Anganwadi workers to attend regular ANC visits and undergo all the essential screenings to monitor both maternal and foetal health. [12], [15]

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